

Unio Thomsoni.

Testa ovata, postice aliquanto acuminata, inæquilateralis, flavescens vel rosaceus, sordide rosaceo obscure radiata, epidermide tenui olivacea obtecta, concentrice striata, prope marginem dorsalem granose radiatim distincte utrinque corrugata. Margo dorsalis postice declivis, antice subsinuate descendens; margo ventralis valde arcuatus, postice vix sinuatus. Umbones parvi, acutiusculi, concinne corrugati, ad $\frac{2}{7}$ longitudinis siti. Dentés cardinales parvi, irregulariter bifidi vel tripartiti, rugosi, striati; posteriores graciles. Pagina interna cæruleo-alba, roseo radiata vel purpureo-fusca.

Long. 15 millim., lat. 21; diam. 10 millim.

Hab. Lake Tanganyika (*Thomson*).

LVII.—*Notes on the French exploring Voyage of 'Le Travailleur' in the Bay of Biscay.* By the Rev. A. M. NORMAN, M.A., F.L.S., &c.*

IN JUNE last a Commission was appointed by the French Government for the purpose of exploring the great depths which captains and Spanish fishermen affirmed existed in the Gulf of Gaseony, off the coasts of Cantabria and the Asturias. The members of this Commission were Professor Milne-Edwards (President), Professor Alphonse Milne-Edwards, the Marquis de Folin, Professor Vaillant, Professor Marion, Professor L. Perier of Bordeaux, and Dr. Paul Fischer. M. Jules Ferry, the Minister of Public Instruction and Science, did my friend Dr. Gwyn Jeffreys and myself the honour of inviting us to act with this Commission as "collaborateurs étrangers," and to accept hospitality on board the Government steamer 'Le Travailleur,' which was placed at the disposal of the Commission for the last fortnight of July.

'Le Travailleur' is a paddle-steamer of about 1000 tons, with a complement of officers and men, which was increased to 145 for the expedition, additional hands being engaged, so that there might be no cessation night or day in the soundings and dredgings. She was carefully fitted up with every scientific appliance necessary for such an expedition, and was most admirably handled by Captain Richard, her commander, and his efficient staff of officers, all of whom threw themselves

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with unflagging zeal and energy into the somewhat unusual duties which devolved upon them, taking most intelligent and lively interest in the various scientific work.

The fittings of the ship generally and the scientific apparatus employed were similar for the most part in character to those employed in the English expeditions; there were, however, two or three novel appliances, which may be mentioned.

The dredge, devised by Alexander Agassiz, which has a metal skeleton frame within the net, so that the extent of bearing on the bottom is not only the mouth but the entire side, appeared admirably designed for use on a very soft bottom, such as is usually met with in the great depths, it having less tendency to bury itself in the mud. Unfortunately, at the second haul, this dredge, coming up with an immense load, was lost by the breaking of the rope; but in the one successful haul the end desired appeared to have been satisfactorily obtained, and the mud consisted of that which belongs to the softest surface-stratum.

Another instrument which was found efficient may be called the "beam-sweep." It consisted of a long bar of wood, similar in size and structure to the "beam" of a large trawl. To this beam were attached at each end bundles of faggots, so as to raise it about a foot from the ground, while at the same time weights were, of course, added to keep it from floating. To this beam three small dredges, such as are ordinarily employed in shallow water, were fastened by ropes three or four fathoms long, so that they might be dragged behind it, one in the centre and one at each end, while the whole length of the beam itself was hung with "tangles." It will be understood that by the use of the "beam-sweep" a much greater breadth of the bottom was swept than is effected by the ordinary single large dredge and its attached "tangles." And it was found to be very effectual; for not only did it come up laden with Crustacea and Echinoderms, but even rare deep-water fish, referred by Prof. Vaillant to the genera *Stromias* and *Macrurus*, were caught in the tangles and secured in beautiful preservation.

Nor must I omit to refer to the most satisfactory results attained by the use of a form of the "hydra" sounding-lead combined with an apparatus in which steel pianoforte-wire, as recommended by Sir William Thomson, was employed as the sounding-line. The wire was coiled on a very narrow drum of considerable diameter, attached to the side of which was a clockwork dial on which each revolution was registered. The circumference of the wheel being known, the multiplica-

tion of the number of revolutions by the circumference at once gives the depth. The advantages of the use of the wire are evidenced, 1st, in the rapidity with which the sounding is effected, the lead descending at the rate of about 175 metres (say 94 fathoms) in a minute, whereas with the ordinary hemp line it would be about 60 metres in the minute, and being wound on the wheel again at the rate of about 85 metres in the minute; 2ndly, in that the friction of the water upon the fine wire is reduced to a minimum, and that consequently nearly absolute perpendicularity of the sounding is secured; 3rdly, the hand feels with much greater certainty than with a rope the moment when the lead reaches the bottom; lastly, the greatly reduced size, and consequent compactness, of the whole machine, which, instead of encumbering the deck, as is necessarily the case when a drum is used on which there are coiled some thousands of fathoms of rope, the drum on which the wire is coiled has only the breadth of an ordinary cart-wheel.

The directions given to the Commission having been to examine that portion of the Gulf lying off the northern coast of Spain, the soundings and dredgings were limited to a distance of about fifteen miles from land. In the fortnight's operations more than 100 soundings were taken, at depths ranging (roughly) from 150 to 2700 metres. The results of these soundings will, when published, be very interesting to the hydrographer and to all interested in Physical Geography. As a general observation, it may be stated that, off St. Sebastian and Santander, where the general range of the Pyrenean mountains and their outliers is at an angle with the coast, the sea-bottom is found to descend with great rapidity down to a thousand fathoms and more, while further west, where the Cantabrian mountains run parallel with the coast, the increase of depth is very gradual, so that from a little to the west of Santander, and thence reaching to Cape Penas, the sea-bottom of the district examined was a plateau with a nearly uniform depth of 60–80 fathoms.

A remarkable ravine in the sea, about twelve miles north of Bayonne, has long been known under the name of the Fosse de Cap-Breton. The ravine runs at right angles to the coast, cutting in two by its narrow channel a great shallow plateau, and extends from the shore seawards about three miles, with a depth of 100–200 fathoms. This ravine had been the scene for many years past of extensive dredging operations by the Marquis de Folin, who had there procured great numbers of Invertebrata of the highest interest; and it was the great success which had attended the investigations of the Marquis in this spot which in a great measure induced the French

Government to inaugurate the more extended examination of that portion of the Bay of Biscay which has now been made. The course of the Fosse de Cap-Breton more than about three miles from land was not known ; but a sounding on the chart further seaward indicating much shallower water, suggested the possibility that the Fosse might be a merely local depression. Cross sections of soundings by the 'Travailleur,' however, have now satisfactorily determined that the Fosse, at about three miles from land, suddenly turns southward, then westward, and then north-westward, until, gradually increasing in depth, it joins the great abyss. It was suggested that this Fosse de Cap-Breton indicated the outlet, under a former geological epoch, of the river Adour, which now empties itself into the sea at Bayonne. The intervening country between Bayonne and Cap-Breton is at the present time occupied by "Les Sables," a range of Tertiary sandhills.

It remains that I should now notice some of the zoological results of the expedition. Dr. Gwyn Jeffreys has already acquainted the Section with those results as relates to the Mollusca. It is with the other classes that I have to do ; and it is necessary that I should preface what I say by stating that the names I give must be received with caution, inasmuch as these notes merely give the impressions conveyed to me as the animals were dredged, being without books to refer to at the time. The specimens are in the hands of those able French naturalists who were members of the Commission, and with whom will rest the determination and description of the animals obtained ; and I have thus had no opportunity of examining and accurately naming them.

As might have been expected, many of the Crustacea obtained off the Portuguese coast by the 'Porcupine' occurred in the North-Spanish dredgings ; among these were *Dorhynchus Thomsoni*, Norman, *Amathia Carpenteri*, Norman, *Ebalia nux*, Norman, *Ethusa granulata*, Norman, *Pagurus tricarinatus*, Norman, *Munida tenuimana*, G. O. Sars, and *Apeudes spinosa*, Sars, and *grossimana*, Norman. The large Norwegian Brachyuran *Geryon tridens*, Kröyer, which was traced southward by the 'Porcupine' to the entrance of the Bay of Biscay, was found to be the most abundant species within the Bay, though in size greatly dwarfed as compared with Norwegian specimens. A *Thysanopoda*, probably *T. norvegica*, was taken several times abundantly, and was doubtless caught as the dredge approached the surface. The large, most remarkable, blood-red Schizopod *Gnathophausia zoëa*, Willemöes-Suhm, which was discovered in the 'Challenger' Expedition near the Azores and off the coast of Brazil,

delighted us with its beauty. Many undescribed species were met with. Preeminent among these were :—a new genus allied to *Dromia**; a very curious new genus of Galatheidæ, which is blind and has the eyestalks converted into spine-tipped processes; a new Palæmonid remarkable for having its carapace girt with a ring of spines; and a *Scalpellum* apparently new.

Among the Gephyrea were two species recently described by Danielssen and Koren from the Norwegian coast and not hitherto found further south—the grand *Sipunculus priapuloides*, which is the largest and most interesting species of the genus known to me, and the curious little *Ochnesoma Steenstrupii*. This latter species I dredged last year in great abundance at the mouth of the Hardanger fiord, Norway. A third Gephyrean obtained is also perhaps the *Phascolosoma squamatum* of the same authors.

In the Fosse de Cap-Breton the curious Annelid *Sternaspis thalassemoides*, Otto, which was formerly referred to the Gephyrea, was found abundantly.

Several examples of the much-disputed *Chætoderma nitidulum* were obtained. This is one of those animals which, exhibiting relationship to more than one class in almost equal ratio, becomes, by its somewhat intermediate characters, of special interest.

Only a single Polyzoön occurred. This was *Triticella Bæckii*, or an allied species. It was infesting the Crab *Geryon tridens*, on which same host the species just named was discovered by Professor G. O. Sars.

There was a remarkable absence of Hydrozoa.

In no class is the collection finer than among the Actinozoa. Of Actinians not secreting a corallum there were a new *Palythoa* (parasitic on the spines of *Cidaris papillata*), an *Actinia* (*Adamsia*?) parasitic on an *Isis*, and two or three other things which were not recognized by us. Of corals there were *Caryophyllia clavus*, a *Flabellum* belonging to the *Flabellum apertum* group (in which the corallum is little or not at all compressed), a *Deltocyathus*, and *Lophohelia prolifera*. Of Gorgonian allies there were *Gorgonia verrucosa* and at least two species of *Isis*, one of which was of considerable size, and when dredged at night was gorgeously phosphorescent, exhibiting a blaze of light. Of Virgularians there were many fine species, including two large forms of *Virgularia* (or a closely allied genus), what appeared to be a *Scytalium* of very elegant

* M. Alphonse Milne-Edwards had previously seen this among the Crustacea dredged by A. Agassiz in the 'Blake,' and proposes to name it *Dicranodromia ovata*.

form and bright-red widely separated fins, a genus which from the curved flaccid state of the polyparium appeared to be devoid of all calcareous axis, *Kophobelemnion stelliferum*, and an example of the genus *Umbellularia**. This genus, first discovered in the Arctic Seas in 1753, and admirably figured by old Ellis, was lost sight of for 120 years, when it was re-discovered by Lindahl in the Swedish Expedition between Greenland and Newfoundland. Subsequently the 'Challenger' dredged it in several spots, and as far south as mid-way between Cape St. Vincent and Madeira. But the finding of this most interesting animal within a few miles of the European coast by 'Le Travailleur' (July 30, in 1160 metres) leads us to hope that hereafter it may even be added to the British fauna.

Echinodermata, as is usual in deep-sea dredgings, were numerous. Of Holothuroidea there were a form entirely unknown to me (furnished with only two rows of suckers, remarkable for their great size, and ten tentacula), a *Molpadia* (which has generally been regarded as an Arctic genus), and *Echinocucumis typica* (an abundant Norwegian type, of which the presence in the Bay of Biscay was evidenced by a single specimen). A curious instance occurred of the meeting in the Bay of Biscay of species hitherto supposed to be confined to Scandinavia with others regarded as eminently Mediterranean. The trawl had been down in 360 metres; and when taken up, out of it rolled one or two hundred huge Holothurians, each about a foot long. It was at once evident that they belonged to two species; and further examination proved about two thirds of them to be the rosy-coloured *Holothuria tremula* of Norway: the remainder, known at a glance by their light-brown colour and flattened side, were *Stichopus regalis* of the Mediterranean. They had apparently met on this neutral ground, and were living together on the most amicable terms.

Sea-Urchins were represented by:—*Echinus microstoma*, Wyville Thomson; *Calveria hystrix* (or an allied species), of which several fine specimens occurred; *Pourtalesia Jeffreysii*; and a new Spatangoid, remarkable on account of its globular form, and referable perhaps to the genus *Agassizia*.

Starfishes were not numerous in species, and gave us nothing new. *Archaster tenuispina* and *bifrons*, *Astropecten andromeda*, and *Brisinga coronata* were the rarer forms.

The Brittlestars were of much importance; for though the number of examples was not great, the number of species (and perhaps of new forms) was considerable. The Ophiuridans

* Probably *Umbellula Thomsonii*, Kölliker.

require attentive study, and cannot be determined at a glance. It will therefore suffice to say that there were many which were not familiar to me, belonging apparently to the genera *Asteronyx* (parasitic on *Isis*, rather small, and possibly distinct from *Loveni*), *Ophiomusium*, *Ophiacantha*, *Ophioscolex*, together with a remarkably large and fine form, which I was unable to refer to any genus known to me. An Ophiurid was also met with which I had discovered last year in Norway, and which I propose to name *Amphiura Danielsseni*.

Sponges, with respect to the number both of species and of specimens obtained, were scarce. *Thenea muricata* (Bowerbank) (= *Wyvillethomsonia Wallichii*, P. Wright), and *Holtenia Carpenteri*, Wyv. Thomson, only occurred in a young state; and a little bunch of the strong coarse spicula of the great *Askonema setubalense*, Kent, came up wrapped round the dredging-line; a single *Hyalonema lusitanicum*, Bocage, was dredged in about 600 fathoms; and a fine though dead specimen of *Farrea* or *Lefroyella* was procured, but, unfortunately, in fragments.

The Foraminifera of course could not, from their minute size, be examined as they were dredged; but among the larger forms noticed in the sieves were many very interesting and recently described types. Foremost among these were the largest and most perfect examples of the beautiful *Orbitolites tenuissimus*, Carpenter, I had ever seen (they equalled a sixpence in size, and were dredged in about 1200 fathoms, July 20), and the very remarkable thread-like *Bathysiphon filiformis*, G. O. Sars (which, as far as I am aware, had before been met with only in the Norwegian fiords). Arenaceous forms were abundant and fine, and included the following recently described species:—

- Rhabdammina abyssorum*, M. Sars.
- Hyperammina ramosa*, H. B. Brady.
- Saccammina spherica*, M. Sars.
- Psammosphæra fusca*, Schultze.
- Storthosphæra albida*, Schultze.
- Astrorhiza arenaria*, Norman.
- Lituola subglobosa*, M. Sars.
- Cyclammmina cancellata*, H. B. Brady.

In concluding these rough notes I must express the deep sense I entertain of the kindness, courtesy, and attention which we received from the French naturalists who were members of the Commission, and also from Captain Richard and all the officers of 'Le Travailleur.'